IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. P03002US1A; 295620-214153

Group Art Unit:	1796	)
		)
Examiner:	Mullis	)
		)
Inventor:	Wang, et al.	)
		)
Serial No.:	10/791,049	)
		)
Filed:	March 2, 2004	)
		)
For:	Method of Making Nano-Particles	)
	of Selected Size Distribution	)

REPLACEMENT APPEAL BRIEF

Sir:

This Replacement Appeal Brief is filed in response to the Notice of Non-Compliant Appeal Brief mailed December 22, 2009, and removes the footnote that referred to a website that had not been made of record in the application.

This appeal is in accordance with 35 U.S.C. § 134 because one or more of the claims of this application have been twice rejected. A Notice of Appeal was filed on July 13, 2009 along with a Pre-Appeal Brief Conference Request. The Panel Decision mailed on August 24, 2009, did not reopen prosecution. Any fees due should be charged to Bridgestone Deposit Account 060925, ref: P03002US1A.

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I. Real Parties in Interest

The real party in interest is Bridgestone Corporation as evidenced by an assignment recorded at Reel/Frame 015040/0556.

II. Related Appeals And Interferences

Three cases that have related subject matter are currently under appeal at the Board: U.S. Application 10/886,283, filed July 6, 2004, published as 2006/0008618 A1; U.S. Application 11/104,759, filed April 13, 2005, published as 2005/0192408; and U.S. Application 10/886,283, filed July 6, 2004, published as 2006/0008618 A1. No decision has been issued from the Board in any of these cases.

Two cases that have related subject matter were previously under appeal at the Board: U.S. Application 10/817,995, filed April 5, 2004, published as 2005/0228074; and U.S. Application 11/305,279, filed December 16, 2005, published as 2007/0142550. Prosecution was reopened in both of these cases without any decision by the Board.

III. Status of Claims

Claims 10-17, 23-25, 27-31, 34-37 are pending and are finally rejected. The rejections of each of these claims are now appealed. Claims 1-9, 18-22, 32, and 33 are withdrawn. Claim 26 is cancelled.

IV. Status of Amendments

No amendments were attempted or entered after final.

V. Summary of Claimed Subject Matter

A. Independent Claim 10

Independent claim 10 is directed to a polymer nanoparticle composition comprising nanoparticles with a size distribution between about 1 nm and 1000 nm, and a polydispersity

index between about 1.5 and about 10. (Page 4, lines 12-14.) The nanoparticles include: (a) an outer layer including first monomer units selected from the group consisting of alkenylbenzenes, conjugated dienes, alkylenes, and mixtures thereof, (page 4, lines 15-17; page 9, line 19 to page 10, line 2); and (b) an inner layer including second monomer units comprised of an alkenylbenzene, (page 4, lines 8; page 4, lines 16; page 10, lines 3-8). The nanoparticles are comprised of the second monomer units and the first monomer units, in a ratio of said second monomer units to said first monomer units greater than 1:1 (page 7, lines 6-7) and include mono-block and diblock polymer chains (page 4, lines 17-18; page 6, line 20, to page 7, line 4; page 7, lines 8-16). The nanoparticles have a size distribution that is polymodal. (Page 4, lines 16-22; page 5, lines 1-4.)

B. Independent Claim 24

Independent claim 14 is directed to a polymer nanoparticle composition comprising nanoparticles with a size distribution between about 1 nm and 1000 nm. (Page 4, lines 12-14.) The nanoparticles include: (a)an outer layer including first monomer units selected from the group consisting of alkenylbenzenes, conjugated dienes, alkylenes, and mixtures thereof, (page 4, lines 15-17; page 9, line 19 to page 10, line 2) and (b) an inner layer including second monomer units comprised of an alkenylbenzene (page 4, lines 8; page 4, lines 16; page 10, lines 3-8). The nanoparticles are comprised of the second monomer units and the first monomer units, (page 7, lines 6-7) and are crosslinked at the inner layer with a cross-linking agent (page 4, lines 22-23; page 8, line 19; page 9, lines 9-18). The nanoparticles have a size distribution that is polymodal with a polydispersity index between about 1.5 and about 10. (Page 4, lines 16-22; page 5, lines 1-4.)

C.   Dependent Claim 11

Claim 11 recites: "The composition of claim 10 wherein said size distribution is bimodal." (Page 2, lines 21-22; and page 7, lines 14-16.)

D.   Dependent Claim 12

Claim 12 recites: "The composition of claim 10 wherein said size distribution is bimodal." (Page 2, lines 21-22; and page 7, lines 14-16.)

E.   Dependent Claim 27

Claim 27 recites: "The polymer nanoparticle composition of claim 24 wherein the polydispersity index of the composition is between 1.5 and 8.0." (Page 3, line 14.)

F.   Dependent Claim 36

Claim 36 recites: "The polymer nanoparticle composition of claim 34, wherein a weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90." (Page 7, lines 12-13).

G.   Dependent Claim 37

Claim 37 recites: "The polymer nanoparticle composition of claim 24, wherein a weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90. (Page 7, lines 12-13)."

VI.   Grounds of Rejection to be Reviewed on Appeal

Whether claims 10-17, 23-25, 27-31, and 34-37 are unpatentable under 35 U.S.C. § 102(b) as anticipated by Krom et al. (U.S. 6,437,050). Whether claims 10, 13-17, 23-25, 27-31, and 34-37 are unpatentable under 35 U.S.C. § 102(b) as anticipated by or in the alternative

under 35 U.S.C. § 103(a) as obvious over Wooley JP20005514791, using U.S. 6,383,500 as a translation.

VII. Argument

A. Introduction

U.S. Patent No. 6,437,050 ("Krom") was cited as anticipating claims 10-17, 23-25, 27-31, and 34-37 of the application. JP2000514791 (using U.S. 6,383,500 as a translation) ("Wooley"), was also cited as anticipating or making obvious the same claims, with the exception of claim 12.

In summary, the Examiner is attempting to fit a square peg (references that do not teach the properly construed claims) into a round hole (the properly construed claims) by taking unreasonably broad views of the claim terms. The Examiner has also failed to address the limitations of several dependent claims.

B. Claims 10-17, 23-25, 27-31, and 34-37 are not Anticipated by Krom

1. Claims 10-17, 23, and 34 are not Anticipated by Krom

Independent claim 10 requires mono-block polymer chains as part of the nanoparticle. Krom does not teach or suggest this feature. The Final Office Action is clearly erroneous in its interpretation of the claim term "mono-block and diblock polymer chains," and absent this interpretation or even under this interpretation, a prima facie case of unpatentability is not made.

The primary point of contention regarding these claims, that Krom does not disclose "mono-block and diblock polymer chains," has already been considered in the first Pre-Appeal Brief Review Conference, which resulted in the reopening of prosecution. (The second Pre-Appeal Brief Review Conference, which did not include an Administrative Patent Judge on the

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panel, did not reopen prosecution.) The only difference now, is that the current Examiner has reframed the issue in terms of claim interpretation, not as a disagreement with what the reference teaches, as was previously done.

The Krom reference discloses particles that are made up of a collection of *diblock* polymer chains that are assembled by micelle assembly and are held together at the core by a cross-linking agent. However, Krom does not disclose nanoparticles that also include mono-block polymer chains that are part of the collection of polymer chains that make up the nanoparticles. Thus, it does not disclose nanoparticles that include "mono-block polymer chains," as required by the claims.

The fact that Krom does not teach or suggest mono-block polymer chains as part of the nanoparticle was supported by a Declaration submitted under 37 C.F.R. § 1.132 by two Ph.D. research scientists[1] that cited to a well-known and respected text on the subject of living anionic polymerization. This Declaration is attached at the Evidence Appendix.

As Applicants understand the Examiner's position, the Examiner no longer challenges the explanation in the previously submitted Declaration under 37 C.F.R. § 1.132 that Krom does not disclose making nanoparticles with mono-block polymer chains. The addition of monomer to the diblock polymer chains, as is recited in Krom, would create either a longer di-block polymer chain or a tri-block polymer chain, depending on the identity of the added monomer.[2]

Instead, the Examiner is construing the claim terms in an unreasonably overbroad manner to make the reference's disclosure of diblock or multi-block polymer chains in the nanoparticle

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[1] Both Dr. Wang and Dr. Pawlow are employed by the owner of this application. Dr. Wang is also an inventor named on this application.

[2] *See* Final Office Action, March 11, 2009.

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fit the claims. The Examiner is construing the meaning of the claim term "mono-block and diblock polymer chains" to mean mono-block moieties and di-block moieties of polymer chains.[3]

It is recognized that "mono-block polymer chain" is not a particularly common term. This indicates that the specification should be referred to for its interpretation. From the context of the claim itself, it is clear that the term mono-block polymer chain is used in conjunction with and in contrast to the term di-block polymer chain. Thus, it should not be read as meaning a moiety of a diblock polymer. In fact, in light of this, the only reasonable interpretation of "monoblock polymer chain" to one of skill in the art is that it means a homopolymer: not a homopolymeric sub-part of a larger multi-block polymer. Furthermore, Applicants are entitled to be their own lexicographer, and it is clear that from the specification that a homopolymer is what is meant by mono-block polymer chain. On page 6, the specification states:

> After formation of the first polymer, a second monomer is added to the polymerization, along with additional initiator. The second monomer polymerizes onto the first polymer to form a diblock polymer **as well as forming a separate second polymer which is a mono-block polymer**.
>
> (emphasis added)

Clearly, in light of the specification, the mono-block polymer chain of claim 10 should be interpreted to be a separate polymer formed by the "second" monomer, *i.e.* a homopolymer. The specification defines a mono-block polymer as a "separate second polymer." Citation to this passage of the specification is not incorporating limitations from the specification into the

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[3] *See* Advisory Action, May 19, 2009, page 2.

claims. It is merely using the specification to clarify the meaning of an uncommon term that is in dispute.

The Examiner is apparently construing the term "polymer chain" to mean moiety. Such an interpretation strains credulity as it would render the mono-, di-, or tri- block terminology meaningless. A di-block or tri-block polymer cannot be both a mono-block and a di-block polymer chain at the same time. A block (as opposed to random) polymer chain has either one (mono-), two (di-), three (tri-), or more blocks. A polymer chain that has two or three blocks cannot be said to be a mono-block polymer chain based on the fact that as a result of having two or three blocks it necessarily also has to have a first block. A person of ordinary skill in the art would not reasonably construe the claim term in this manner.

Even the Examiner, in the Advisory Action of May 19, 2009 admitted that "[a]pplicants argument that a 'polymer chain that has two or three blocks cannot be said to be a mono-block polymer chain' is correct." Thus, it is unclear how the rejection can be maintained.

Even under the Examiner's interpretation that the claim term "polymer chain" means moiety, the cited references do not make out a prima facie case of unpatentability. The reference only teaches particles that are made of multi-block polymer chains. The only way to apply the teachings of the references to anticipate the claims is to consider that a di-block or tri-block polymer chain is both a mono-block and a di-block polymer chain at the same time, and as mentioned above and as admitted by the Examiner, this cannot be true.

In the Advisory Action, the Examiner mentioned that the claims recite that the nanoparticles "include" the "mono-block and di-block polymer chains", and that this is not a synonym with the term "be." However, this argument is immaterial because the cited references

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do not teach the <u>inclusion</u> of both mono-block and di-block polymer chains (or moieties) in the nanoparticles, as is required by the claims. The references do not teach mono-block polymer chains at all, and they do not teach both mono-block and di-block moieties

The Advisory Action also expressed confusion about Applicants argument that "the term 'mono-block' should not be read as a subpart of a diblock copolymer," because "Applicants own nanoparticle ... is recited to include mono and diblocks as subparts." Perhaps the confusion is based on the Examiner viewing the claimed nanoparticles as a single polymer. However, this is contrary to the description in the nanoparticles in the current specification and with the description of the nanoparticles in the Krom reference. The nanoparticles of claim 10 are an aggregate of diblock and mono-block polymer chains that are brought together by micelle self-assembly. The chains are then cross-linked together at the core. This unique structure is described in the specification and cannot be considered to be a single polymer with many blocks. The claim language requires a nanoparticle comprising polymer chains, this makes it clear that the nanoparticles of claim 10 should be considered to have the aggregated polymer chain structure described in the specification, and not as a single polymer. The nanoparticles of the Krom reference are similarly constructed, but the aggregated polymer chains do not include mono-block polymer chains, nor do they display the polydispersity characteristics.

The mono-block polymers required by the claims are more than mere design choices, as can be seen in the Examples of the invention, where varying the mono-block polymer content increases the polydispersity of the nanoparticles.

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Accordingly, because the recited mono-block polymer limitation is not taught or suggested by Krom, independent claim 10 and its dependent claims should be allowed over the cited art.

In addition, claim 10 also contains the polydispersity limitation that is discussed below in Section VII.B.2, and for this separate reason, claim 10 and its dependent claims should be allowed over the cited art.

2.   Claims 24-25, 27-31, and 35 are not Anticipated by Krom

Independent claim 24 requires that the nanoparticles have "a polydispersity index between about 1.5 and about 10." In previous Office Actions the Examiner had correctly noted that Krom did not disclose the limitation of a polydispersity index of about 1.5 to 10. However, when prosecution was reopened after the first Pre-Appeal Brief Conference Review, the next Office Action stated that this element was disclosed in Krom. The previous Office Actions were correct, Krom does not disclose this limitation either directly or inherently.

The only indication of polydispersity of the nanoparticles in Krom, is that they are preferably substantially monodisperse, with a Mw over Mn ratio of 1 being substantially monodisperse. (Krom, column 2, lines 11-13.) Krom also discloses that the nanoparticles preferably have a polydispersity of less than about 1.3, but more preferably less than about 1.1. (Krom, column 2, lines 13-15.) No person of skill in the art would envisage the claim limitation of "polydispersity index between about 1.5 and about 10" in the Krom reference.

The Advisory Action declared that the word "about" would allow for enough leeway to overlap the claim range. However, the term "about" should not be construed so broadly in this case, because the polydispersity index represents a ratio of weight-average molecular weight to

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number-average molecular weight. A value of 1 is the lowest possible polydispersity index number. Thus, whereas the index value of 1.3 is a 30% increase over 1, the index value of 1.5 is a 50% increase over 1. Therefore, the difference between a 1.3 to 1.5 polydispersity index represents a 20% difference in the ratio, when the base value of 1 is considered. The term "about" should not be construed to enlarge a range by 20%. Furthermore, even if the ranges did touch or slightly overlap, the Krom reference does not teach the claimed range with "sufficient specificity" and one of skill in the art would not "clearly envisage" the claimed range. MPEP § 2131.03. Krom clearly teaches away from high polydispersity, stating that the nanoparticles are preferably monodisperse, and the high polydispersity recited by the current claims was unexpectedly obtained by the inclusion of mono-block polymers in the nanoparticle.[4] *See In re Geisler*, 116 F.3d 1465 (Fed. Cir. 1997) (discussing the *Malagari* test, where evidence of teaching away or unexpected properties will render a claim range that is touched by the reference not anticipated).

The only additional argument that the Final Office Action presented to bolster the bare assertion that Krom's disclosed polydispersity index of less than about 1.3 anticipates the claimed "about 1.5 to 10" polydispersity index is that "the 'further' monomer described by patentees [Krom] at column 3, line 10, would add to the active chain ends already present a ratio of mono to diblock of about 1 would result." However, as explained in the previously submitted Declaration by Wang and Pawlow, such a monomer addition would only make the nanoparticles

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[4] It was unexpectedly discovered by the inventors of the current application that higher degrees of polydispersity were achieved by adding mono-block (homopolymer) chains to the nanoparticles. This allowed the creation of nanoparticles of higher polydispersity by manipulating the ratio of mono-block and di-block polymers. As stated on page 7 of the specification, "[w]ithout being bound by theory, it is believed that at least a bimodal nano-particle size distribution results because the micelle formation of mono- and diblocks is a bimodal distribution." There is no teaching in Krom that allows this manipulation of the polydispersity index of core-shell nanoparticles to levels that reach about 1.5 to 10.

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larger as a whole, it would not be expected to affect the polydispersity index at all, and reliance by the Examiner on such a theory must be supported. *See* MPEP § 2144.03(A).

Accordingly, because the recited polydispersity limitation is not taught or suggested by Krom, independent claim 24 and its dependent claims should be allowed over the cited art.

3. Dependent Claim 11 is not Anticipated by Krom

Claim 11 requires that the size distribution of the nanoparticles is bimodal. The Examiner has not pointed to any disclosure in Krom that shows this limitation, but merely relies on an unreasonably broad interpretation of the term "bimodal" and broad generalizations about the prior art, which are not supported by any evidence, that most polymers have infinite modes. Section VII.C.2 explains why this generalization is incorrect and what the term "polymodal," which is the genus of which bimodal is a species, means to one of skill in the art.

4. Dependent Claim 12 is not Anticipated by Krom

Claim 12 requires that the size distribution of the nanoparticles is trimodal. The Examiner has not pointed to any disclosure in Krom that shows this limitation, but merely relies on an unreasonably broad interpretation of the term "trimodal" and broad generalizations about the prior art, which are not supported by any evidence, that most polymers have infinite modes. Section VII.C.2 explains why this generalization is incorrect, and explains what the term "polymodal," which is the genus of which trimodal is a species, means to one of skill in the art.

5. Dependent Claim 27 is Not Anticipated by Krom

Claim 27 requires that the polydispersity index of the composition is between 1.5 and 8.0. This claim is slightly narrower than the claim it depends on, claim 24, in part because it does not

use the "about" modifier for the range. Accordingly, Krom's maximum disclosed range of about 1.3 is further away from the range required by this claim, and does not anticipate this claim.

6. Dependent Claims 36 and 37 are Not Anticipated by Krom

Claims 36 and 37 each require that the "weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90." The Examiner has not addressed this limitation. As discussed above, Krom does not disclose any monoblock polymer chains at all, much less the ratio of monoblock to diblock polymer chains required by these claims. Therefore, this limitation cannot be met, and these claims cannot be anticipated.

B. Claims 10, 13-17, 23-25, 27-31, and 34-37 are not Anticipated by Wooley

1. Claims 10, 13-17, 23, and 34 are not Anticipated by Wooley

Independent claim 10 requires mono-block polymer chains as part of the nanoparticle. Wooley does not teach or suggest this feature.

The Final Office Action states that the Wooley reference discloses a core-shell particle composition, and refers to Example 3 at column 74 as disclosing a diblock copolymer of styrene and vinyl pyridine. The Examiner then states that "since a diblock copolymer as is disclosed in the examples is two monoblocks attached to each other the limitations of the claims are met." Section VII.B.1 above explains in detail why this reasoning is erroneous and why the Examiner is taking an unreasonably broad view of the meaning of the term "mono-block polymer chain." In summary, a diblock copolymer chain cannot be both a diblock and a monoblock polymer chain as required by claim 10. The Examiner even admitted as much in the Advisory Action.

Accordingly, because the recited mono-block polymer limitation is not taught or suggested by Wooley, independent claim 10 and its dependent claims should be allowed over the cited art.

In addition claim 10 also contains the polydispersity limitation that is discussed below in Section VII.B.2, and for this separate reason claim 10 and its dependent claims should be allowed over the cited art.

2. Claims 24-25, 27-31, and 35 are not Anticipated by Wooley

Independent claim 24 requires that the nanoparticles have "a polydispersity index between about 1.5 and about 10." The Final Office Action did not even attempt to point to an anticipating disclosure of this element.

The highest polydispersity index that Wooley discloses for its nanoparticles is one example at 1.17. Thus, Wooley discloses a polydispersity index that is even further away from the claimed range than Krom. Accordingly, Wooley cannot anticipate claims 24-25, 27-31, and 35 for at least the same reasons stated above in Section VII.A.2.

Independent claim 24 also recites that the nanoparticles have "size distribution that is polymodal." This limitation is not present in the Wooley reference. The Final Office Action stated that "while the term 'polymodal' is disclosed, polymers are generally not monodisperse and as such can generally be viewed as having an infinite number of modes." Applicants do not find the term "polymodal" in the Wooley reference, and presumably the Final Office Action intended to say that this term was <u>not</u> disclosed in Wooley, since the second part of the sentence seems to state that the limitation polymodal is inherent or obvious.

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The statement that polymers are generally not monodisperse is not supported by any evidence, and it is contradicted by the two cited references. Krom discloses that the nanoparticles are preferably monodisperse, and Wooley discloses a polydispersity index of 1.17, which is near to the theoretical minimum of 1. Furthermore, those of skill in the art know that polymers made by living anionic polymerization, such as in Krom, are known to have very low polydispersity indexes. Thus, this statement cannot be used to support the inherency of the polydispersity index range required by the claim, nor the inherency of the claim term "polymodal."

One of skill in the art would recognize that the claim term "polymodal" would mean having more than one peak on a graph of molecular weight distribution. While no collection of polymers has an entirely consistent molecular weight throughout, a bell-shaped curve on a graph of molecular weight distribution would indicate monomodality. A curve having two or more peaks, however, would represent polymodality. The Examiner is taking an unreasonably broad view of the term "polymodal" if, as it appears, he is arguing that it is met by a collection of polymers that generally has different sizes or weights. Those of skill in the art know that a collection of polymers will not have the same molecular weight throughout the sample; they also know that this does not mean that the collection has an infinite number of modes or that it is polymodal. Thus, the claim term "polymodal" is not disclosed or inherently present in Wooley.

3. Dependent Claim 11 is Not Anticipated by Wooley

Claim 11 requires that the size distribution of the nanoparticles is bimodal. The Examiner has not pointed to any disclosure in Wooley that shows this limitation, but merely relies on an unreasonably broad interpretation of the term "bimodal" and broad generalizations

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about the prior art (which are not supported by any evidence) that most polymers have infinite modes. Section VII.C.2 explains why this generalization is incorrect and what the term "polymodal," which is the genus of which bimodal is a species, means to one of skill in the art.

4. Dependent Claim 27 is Not Anticipated by Wooley

Claim 27 requires that the polydispersity index of the composition is between 1.5 and 8.0. This claim is slightly narrower than the claim it depends on, claim 24, in part because it does not use the "about" modifier for the range. Accordingly, Wooley's maximum disclosed range of 1.17 is further away from the range required by this claim, and does not anticipate this claim.

5. Dependent Claims 36 and 37 are Not Anticipated by Wooley

Claims 36 and 37 each require that the "weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90." The Examiner has not addressed this limitation at all. As discussed above, Wooley does not disclose any monoblock polymer chains at all, much less the ratio of monoblock to diblock polymer chains required by these claims. Therefore, this limitation cannot be met, and these claims cannot be anticipated.

C. Claims 10, 13-17, 23-25, 27-31, and 34-37 are not Made Obvious by Wooley

Claims 10, 13-17, 23-25, 27-31, and 34-37 were also alternatively rejected for being obvious over Wooley. No other references were cited for combination with Wooley in this rejection. The discussion above in Section VII.B expressed why the claim elements of mono-block polymer, polydispersity index, and polymodality were not present or inherent, and why the references teach away from the inherency of the polydispersity index required by the claims. The discussion in Section VII.B also presented counterarguments against the Examiner's

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statements regarding the inherency of the polymodal size distribution required by the claims. This teaching away and counterarguments are also applicable against the obviousness rejection.

1. Claims 10, 13-17, 23, and 34 are not Made Obvious by Wooley

Further reasons that mitigate against the obviousness of the claims over Wooley include the fact that the mono-block polymers and polydispersity index limitations required by the claims are more than mere design choices, as can be seen in the Examples of the invention. In fact, these limitations represent unexpected results that were discovered by the inventors.

As shown in the Examples of the specification, it was unexpectedly discovered that higher degrees of polydispersity were achieved by adding mono-block (homopolymer) chains to the nanoparticles. This allowed the creation of nanoparticles of higher polydispersity by manipulating the ratio of mono-block and di-block polymers. In contrast, there is no teaching in Wooley that enables the manipulation of the polydispersity index of core-shell nanoparticles to levels that reach about 1.5 to 10. The presence of mono-block polymers in nanoparticles was not previously recognized as a result-effective variable that could control polydispersity.

Accordingly, because the recited polydispersity limitation is not taught or suggested by Wooley, independent claim 10 its dependent claims should be allowed over the cited art.

2. Claims 24-25, 27-31, and 35 are not Made Obvious by Wooley

For the reasons expressed in Section VII.C, and the reasons expressed in Section VII.C.1 above regarding the polydispersity index required by the claims, claims 24-25, 27-31, and 35 are also not made obvious by Wooley.

3. Dependent Claim 11 is Not Made Obvious by Wooley

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Nothing additional was put forward by the Examiner to express why claim 11 would be obvious. No reference discloses a size distribution that is bimodal, i.e. having two peaks on a molecular weight distribution graph. No evidence or reasoning was put forth as to why this would be obvious. Accordingly, a prima facie case of obviousness has not been made against claim 11.

4. Dependent Claim 27 is Not Made Obvious by Wooley

Claim 27 requires that the polydispersity index of the composition is between 1.5 and 8.0. This claim is slightly narrower than the claim it depends on, claim 24, in that it does not use the "about" modifier for the range. Nothing additional was put forward by the Examiner to express why claim 27 would be obvious in light of Wooley's maximum disclosed polydispersity index of 1.17, and Applicant's have shown that their increased polydispersity is an unexpected result. Therefore, these claims have not been shown to be obvious.

5. Dependent Claims 36 and 37 are Not Made Obvious by Wooley

Claims 36 and 37 each require that the nanoparticles have "a weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90." The Examiner has not addressed this limitation. As discussed above, Wooley does not disclose any monoblock polymer chains at all, much less the ratio of monoblock to diblock polymer chains required by these claims. Nothing additional was put forward by the Examiner to express why claims 36 and 37 would be obvious in light of Wooley. Applicants have shown that the presence of monoblock polymer chains produces unexpected results in polydispersity. Therefore, these claims have not been shown to be obvious.

VIII. Claims Appendix

A claims appendix containing a copy of the claims subject to this appeal is attached.

IX.   Evidence Appendix

The previously submitted Declaration under 37 C.F.R. § 1.132 by Xiaorong Wang and James Pawlow that was mentioned in the Argument section is attached at the Evidence Appendix.
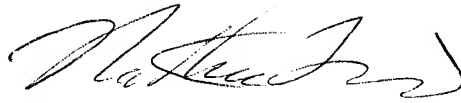
X.   Related Proceedings Appendix

There are no decisions that have been rendered by a court or the Board from related proceedings. A related proceedings appendix indicating "None" is attached.

Respectfully submitted,

Date:___/5/10_____   By:_____

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CLAIMS APPENDIX

1.   (Withdrawn) A process for forming a nanoparticle composition comprising:

        a.   polymerizing conjugated diene monomer in a hydrocarbon solvent to form a first reaction mixture;

        b.   charging to said reaction mixture alkenylbenzene monomer in excess of said conjugated diene monomer and catalyst to form mono-block and diblock polymers;

        c.   forming micelles of said mono-block and diblock polymers; and ;

        d.   adding at least one crosslinking agent to cross-link said micelles and form nanoparticles, said nanoparticles having a poly(alkenylbenzene) core and an outer layer including monomer units selected from the group consisting of conjugated dienes, alkenylbenzenes, alkylenes, and mixtures thereof; and

        wherein said nanoparticles have a size distribution of between about 1 and 1000 nm.

2.   (Withdrawn) The process of claim 1 wherein a ratio of conjugated diene monomer to alkenylbenzene monomer is between about 0.1:1 and 0.8:1.

3.   (Withdrawn) The process of claim 1 wherein said size distribution is bimodal.

4.   (Withdrawn) The process of claim 1 wherein said core includes cross-linked and non-cross-linked areas.

5.   (Withdrawn) The process of claim 1 wherein said size distribution is trimodal.

6.   (Withdrawn) The process of claim 1 further comprising a hydrogenation step.

7.   (Withdrawn) The process of claim 1 wherein said step a is performed in the presence of a functionalized initiator.

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8.   (Withdrawn)   The process of claim 1 wherein said alkenylbenzene monomer units are selected from the group consisting of styrene, α-methylstyrene, 1-vinyl naphthalene, 2-vinyl naphthalene, 1-α-methyl vinyl naphthalene, 2-α-methyl vinyl naphthalene, vinyl toluene, methoxystyrene, t-butoxystyrene, and the like, as well as alkyl, cycloalkyl, aryl, alkaryl, and aralkyl derivatives thereof, in which the total number of carbon atoms in the combined hydrocarbon is not greater than 18, as well as any di- or tri-vinyl substituted aromatic hydrocarbons, and mixtures thereof.

9.   (Withdrawn)   The process of claim 1 wherein said conjugated diene monomers are selected from the group consisting of 1,3-butadiene, isoprene, 1,3-pentadiene and mixtures thereof.

10.   (Previously Presented)   A polymer nanoparticle composition comprising nanoparticles with a size distribution between about 1 nm and 1000 nm, and a polydispersity index between about 1.5 and about 10, wherein said nanoparticles include:

a.   an outer layer including first monomer units selected from the group consisting of alkenylbenzenes, conjugated dienes, alkylenes, and mixtures thereof, and

b.   an inner layer including second monomer units comprised of an alkenylbenzene, wherein said nanoparticles are comprised of said second monomer units and said first monomer units, in a ratio of said second monomer units to said first monomer units greater than 1:1,

and include mono-block and diblock polymer chains,

and wherein said nanoparticles have a size distribution that is polymodal.

11.   (Original)   The composition of claim 10 wherein said size distribution is bimodal.

12.   (Original)   The composition of claim 10 wherein said size distribution is trimodal.

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13.   (Previously Presented)   The composition of claim 10, wherein, provided that the diblock polymer chains do not have the same monomer units in both the outer layer and the inner layer, the alkenylbenzene monomer units of the outer layer and the alkenylbenzene monomer units of the inner layer are independently selected from the group consisting of styrene, α-methylstyrene, 1-vinyl naphthalene, 2-vinyl naphthalene, 1-α-methyl vinyl naphthalene, 2-α-methyl vinyl naphthalene, vinyl toluene, methoxystyrene, t-butoxystyrene, as well as alkyl, cycloalkyl, aryl, alkaryl, and aralkyl derivatives thereof, in which the total number of carbon atoms in the combined hydrocarbon is not greater than 18, as well as any di- or tri-vinyl substituted aromatic hydrocarbons, and mixtures thereof.

14.   (Original)   The composition of claim 10 wherein said conjugated diene monomer units are selected from the group consisting of C_4-C_8 conjugated diene monomers and mixtures thereof.

15.   (Previously Presented)   The composition of claim 10 wherein said outer layer includes conjugated diene monomers selected from the group consisting of 1,3-butadiene, isoprene, 1,3-pentadiene and mixtures thereof.

16.   (Original)   The composition of claim 10 wherein said alkylene monomer units are obtained by hydrogenating said conjugated diene monomer units.

17.   (Original)   The composition of claim 10 wherein said mono-block and di-block polymer chains are crosslinked.

18.   (Withdrawn)   A rubber composition comprising:

      a.   rubber; and

      b.   polymer nanoparticles having a size distribution between about 1 and 1000 nm, and including:

(i)   an outer layer having monomer units selected from the group consisting of conjugated dienes, alkenylbenzenes, alkylenes, and mixtures thereof, and

(ii)   an inner layer including alkenylbenzene monomer units.

19.   (Withdrawn) The composition of claim 18 wherein said size distribution is bimodal.

20.   (Withdrawn) The composition of claim 18 wherein said size distribution is trimodal.

21.   (Withdrawn) The composition of claim 18 wherein said nanoparticles are crosslinked.

22.   (Withdrawn) The composition of claim 18 wherein said rubber is selected from the group consisting of synthetic polyisoprene rubber, styrene-butadiene rubber (SBR), styrene-isoprene rubber, styrene-isoprene-butadiene rubber, butadiene-isoprene rubber, polybutadiene, butyl rubber, neoprene, acrylonitrile-butadiene rubber (NBR), silicone rubber, the fluoroelastomers, ethylene acrylic rubber, ethylene-propylene rubber, ethylene-propylene terpolymer (EPDM), ethylene vinyl acetate copolymer, epichrolohydrin rubber, chlorinated polyethylene-propylene rubbers, chlorosulfonated polyethylene rubber, hydrogenated nitrile rubber, terafluoroethylene-propylene rubber and mixtures thereof.

23.   (Previously Presented) The composition of claim 10 wherein the polydispersity index is between about 1.5 and about 8.0.

24.   (Previously Presented) A polymer nanoparticle composition comprising nanoparticles with a size distribution between about 1 nm and 1000 nm, wherein said nanoparticles include:

a.   an outer layer including first monomer units selected from the group consisting of alkenylbenzenes, conjugated dienes, alkylenes, and mixtures thereof, and

b.   an inner layer including second monomer units comprised of an alkenylbenzene;

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wherein said nanoparticles are comprised of said second monomer units and said

first monomer units, and are crosslinked at the inner layer with a cross-linking agent;

wherein said nanoparticles have a size distribution that is polymodal with a

polydispersity index between about 1.5 and about 10.

25.   (Previously Presented) The polymer nanoparticle composition of claim 24 wherein the

ratio of said first monomer units to said second monomer units is between 0.2:1 and 0.7:1.

26.   (Cancelled)

27.   (Previously Presented) The polymer nanoparticle composition of claim 24 wherein the

polydispersity index of the composition is between 1.5 and 8.0.

28.   (Previously Presented) The polymer nanoparticle composition of claim 24 wherein the

first monomer units are conjugated diene monomers selected from the group consisting of 1,3-

butadiene, isoprene, 1,3-pentadiene and mixtures thereof.

29.   (Previously Presented) The polymer nanoparticle composition of claim 28 wherein the

conjugated diene monomer is 1,3-butadiene.

30.   (Previously Presented) The polymer nanoparticle composition of claim 24 wherein the

second monomer units comprise styrene.

31.   (Previously Presented) The polymer nanoparticle composition of claim 29 wherein the

second monomer units comprise styrene.

32.   (Withdrawn) A crosslinked core-shell nanoparticle comprising:

    i.   diblock copolymer chains, comprising:

        a.   shell monomer units selected from the group consisting of

            alkenylbenzenes, conjugated dienes, alkylenes, and mixtures thereof, and

        b.   core monomer units of an alkenylbenzene;

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ii.   monoblock polymer chains, comprising monomer units of an alkenylbenzene;

wherein the core of the nanoparticle comprises the core monomer units of the diblock copolymer chains and the monomer units of the monoblock polymer chains, and the shell of the nanoparticle comprises the shell monomer units of the diblock copolymer chains;

wherein said nanoparticles are crosslinked at the core with a crosslinking agent and have a size distribution that is polymodal.

33.   (Withdrawn) The nanoparticle of claim 32, wherein the nanoparticle has a polydispersity index between about 1.5 and about 10.

34.   (Previously Presented) The polymer nanoparticle composition of claim 10, wherein the nanoparticle is crosslinked at the core with a crosslinking agent.

35.   (Previously Presented) The polymer nanoparticle composition of claim 24 wherein the ratio of said first monomer units to said second monomer units is between about 0.1:1 and about 0.8:1.

36.   (Previously Presented) The polymer nanoparticle composition of claim 34, wherein a weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90.

37.   (Previously Presented) The polymer nanoparticle composition of claim 24, wherein a weight ratio of the mono-block polymer chains to the diblock polymer chains is 90 to 10: 10 to 90.

EVIDENCE APPENDIX

(none)

RELATED PROCEEDINGS APPENDIX

(none)